



MODERN TECHNOLOGIES FOR PROCESSING DIAMONDS INTO DIAMONDS

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ABSTRACT

A list of operations and equipment used for processing natural diamond crystals into polished diamonds is provided. The main attention is paid to the automation of processing processes (sawing, peeling, cutting) and the creation of modern machine tools.

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1. A BRIEF HISTORY OF DIAMONDS AND DIAMONDS [1]

Researchers have found that the first diamond was found in India more than 3000 BC. 500 BC, diamonds were known to the ancient Greeks, as evidenced by a bronze figurine with two rough diamonds for eyes, which is kept in the British Museum. Currently, quite a large number of unique diamonds and polished diamonds are known. The world's largest diamond was discovered in 1905 at the Premier mine in the Pretoria region of South Africa. This diamond was named Cullinan and was valued at \$7.5 billion. The Orlov Diamond was found in India, cut into a diamond of rare purity, soldered into a silver frame, and adorned the scepter of Russian tsars called the Amsterdam Diamond. The process of turning a diamond into a diamond. Refers to the handmade work of top-class craftsmen and includes: marking, splitting or sawing, peeling and cutting. Diamond splitting allows, with minor losses of raw materials and little time spent, to divide the diamond crystal into parts in order to use the diamond raw materials most efficiently. The possibility of a crystal splitting is determined by the presence of a certain chemical bond, which provides the weakest energy bond in the crystal along the cleavage plane. Diamond sawing = an operation necessary to separate crystals into parts in order to rationally use rough diamonds when processing them into diamonds. When sawing, various defects are removed. The sawing process is easy to mechanize and automate. Diamond roughing is one of the most critical operations in the technological cycle of diamond production. The utilization rate of rough diamonds and the quality of finished diamonds largely depend on its implementation [7, 8].

2. THE TASK OF INVESTIGATION

The purpose of roughing is to give the diamond the shape of the future diamond in plan, to prepare the diamond for cutting and to improve the quality of the diamond by removing all or some defects. Peeling is difficult to mechanize and automate, which is the main problem solved in this article. This task was successfully solved due to the first use of soft supports [2-4], active control [5] and a multi-position diamond holder [6]. Technical documentation was developed and a pilot industrial sample of a two-position semi-automatic mod. ПІОА-01К (Fig. 1 and 2) [9, 10].

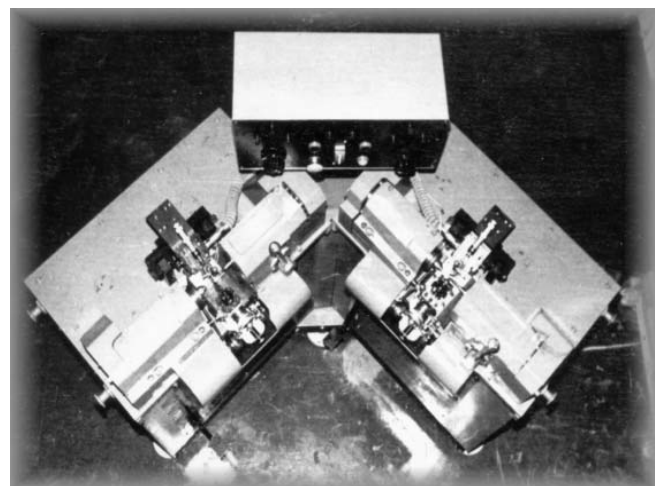


Fig. 1. Top view of the two-position semi-automatic mod. ПІОА-01К

The kinematic diagram of one position of this semi-automatic device is shown in Fig. 3.

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The spindle rotates from a DC electric motor through V-belt and toothed-belt transmissions, and the rotation of the distribution shaft of the trajectory mechanism, simulating the movements of a worker's hands, through a gearbox at three frequencies.

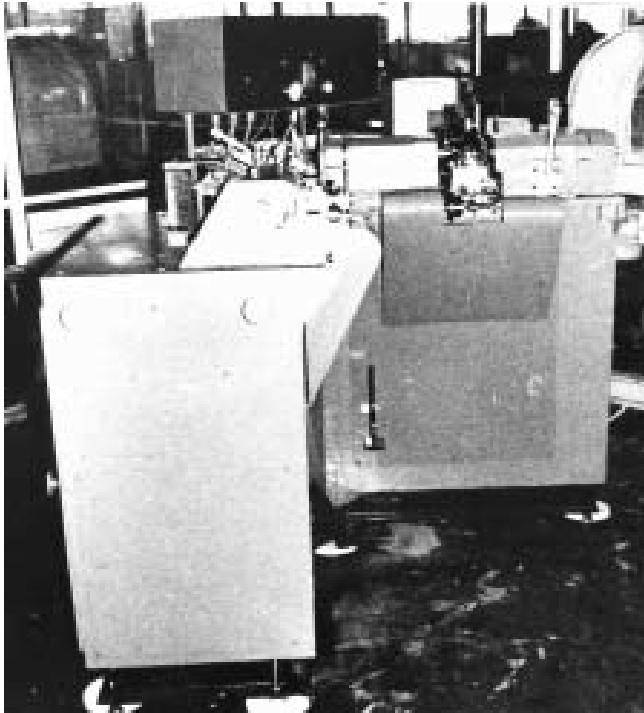


Fig. 2. Side view of the two-position semi-automatic mod. ПОА-01К

The operating cycle of the semi-automatic machine consists of clamping and orientation of the diamond crystal. Then the main movement drive is turned on. After acceleration of the main movement engine, the drive of the trajectory mechanism is turned on. Next, the caliper is supplied and the automatic feed is turned on. At the first and second stages of turning a diamond crystal, the vertical movement mechanism is turned on. When the diamond product reaches a given diameter, the active control system gives a command to turn on the electromagnet, which stops the automatic feeding and turns on the time relay. At this time, the diamond crystal is nursed without transverse feeding. This completes the processing cycle. During the processing of a diamond crystal, the multi-cutting head is periodically rotated and fixed as the cutter crystals become dull.

3. CONCLUSION

This article describes the first steps in automating the process of turning a diamond crystal. Currently, the use of CNC and the replacement of a diamond cutter with a diamond wheel makes new generation machines of this type more progressive, including thanks to artificial intelligence.

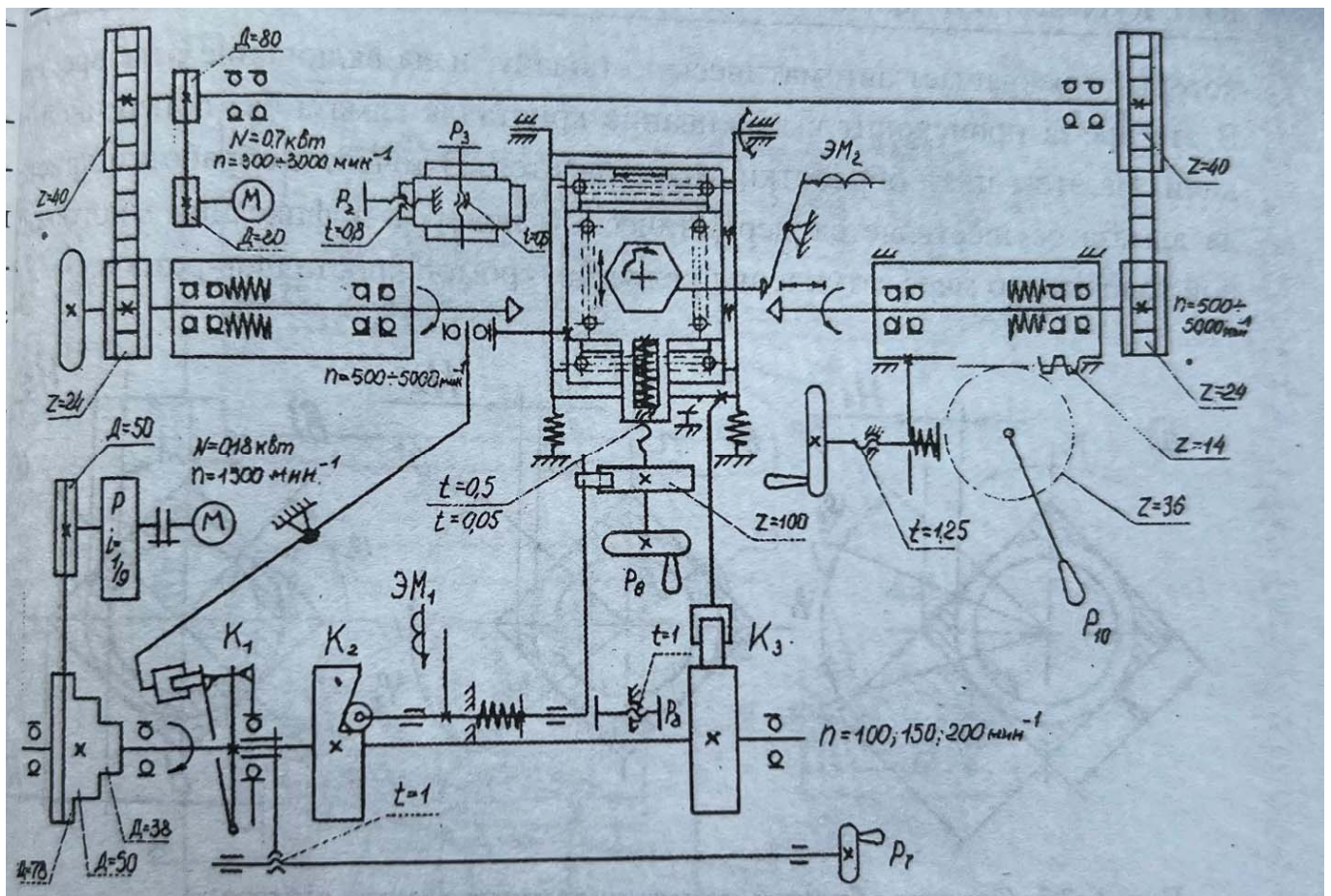


Fig. 3. Kinematic diagram of one position of a semi-automatic mod. ПОА-01К

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